

THE WEATHER AND CIRCULATION OF JANUARY 1965

Mild in the West and Cold in the East

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1. MEAN CIRCULATION

A marked decrease of oceanic blocking in January was accompanied by a sharp increase in the zonal index. In the Pacific the strong blocking ridge and area of positive 700-mb. height anomaly, which was over the Bering Sea in December [1], moved northward in January. This blocking was associated with the High over the Arctic Ocean on the mean 700-mb. circulation for January (fig. 1) and its related area of positive height anomaly (fig. 2). The mid-Pacific westerlies also were displaced northward (from December) but were still south of their normal position for January (fig. 3). At sea level the Aleutian Low and accompanying principal storm tracks were slightly south of their expected positions in January.

The westerlies also shifted northward over the eastern Pacific and western North America. Here westerly cyclonic flow in December was replaced by more anticyclonic flow in January, and a ridge slightly stronger than normal was observed over western North America. Cyclonic flow prevailed over eastern North America and the western Atlantic, the northern portion of this broad trough being deeper than the southern portion, partly as a result of the strong blocking High in the Arctic.

Only a remnant of the December blocking pattern in the Atlantic remained in January. This appeared as a ridge over eastern Greenland where 700-mb. heights were only slightly above normal. Some of December's strong blocking wave also appears to have retrograded to merge with the Arctic High. Weakening of Atlantic blocking accompanied the return to a more nearly normal circulation across the Atlantic and the principal jet axis at 700 mb. was close to its expected position (fig. 3). As in the Pacific, there was an increase and northward displacement of the principal storminess and the Icelandic Low was only slightly south of its usual location.

The circulation across Europe and Asia (figs. 1 and 2) was more meridional with respect to normal. A trough with below normal 700-mb. heights was the principal feature in Europe and the Mediterranean where the weather in January was cold and wet. Another deep trough with a pronounced negative tilt was observed in north central Siberia between the Arctic High and a stronger than normal ridge over eastern Russia.

2. TEMPERATURE

The departure of average temperature from normal for January (fig. 4) shows a well-defined gradient of temperature anomaly from central Montana southeastward to the central Gulf States. Temperatures to the east were below normal, and to the west they were well above normal. Greatest departures were observed across the Northern Great Plains. This was one of the warmest Januarys ever observed in Wyoming and southwestern Montana where temperatures averaged up to 10° F. above normal. Portions of the Great Basin also had near-record warmth, produced in part by a deficiency of snow.

The pattern of temperature anomaly was well related to the concurrent circulation. The degree of cold in the eastern half of the United States during the cold season is closely dependent upon the amplitude of the ridge-trough system over North America. Temperature departures from normal of 2° to 4° F. in the East are in general agreement with the position and intensity of the 700-mb. ridge in western North America (figs. 1 and 2). The northwesterly flow in mid-continent transported cold Canadian air masses southeastward from a source region that has been unusually cold this winter. Mild maritime air dominated the West which was under the influence of a ridge and westerly flow from the Pacific.

3. PRECIPITATION

Except for the Great Basin most of the West had above normal precipitation in January (fig. 5). Some of this was related to storms moving across the Northwest from the Pacific. Upslope conditions contributed to precipitation in the Rocky Mountain States, with overrunning of cold Polar air by warm moist Pacific air also a factor.

It was very dry in the Rio Grande Valley where the anomalous flow was northerly and principal storminess passed north of the area. Dry weather also prevailed from the eastern Dakotas to Wisconsin. This area lay between two primary storm tracks, one of which was north of the region and the other to the south. The southern track was associated with a band of above normal precipitation from the Middle Mississippi Valley

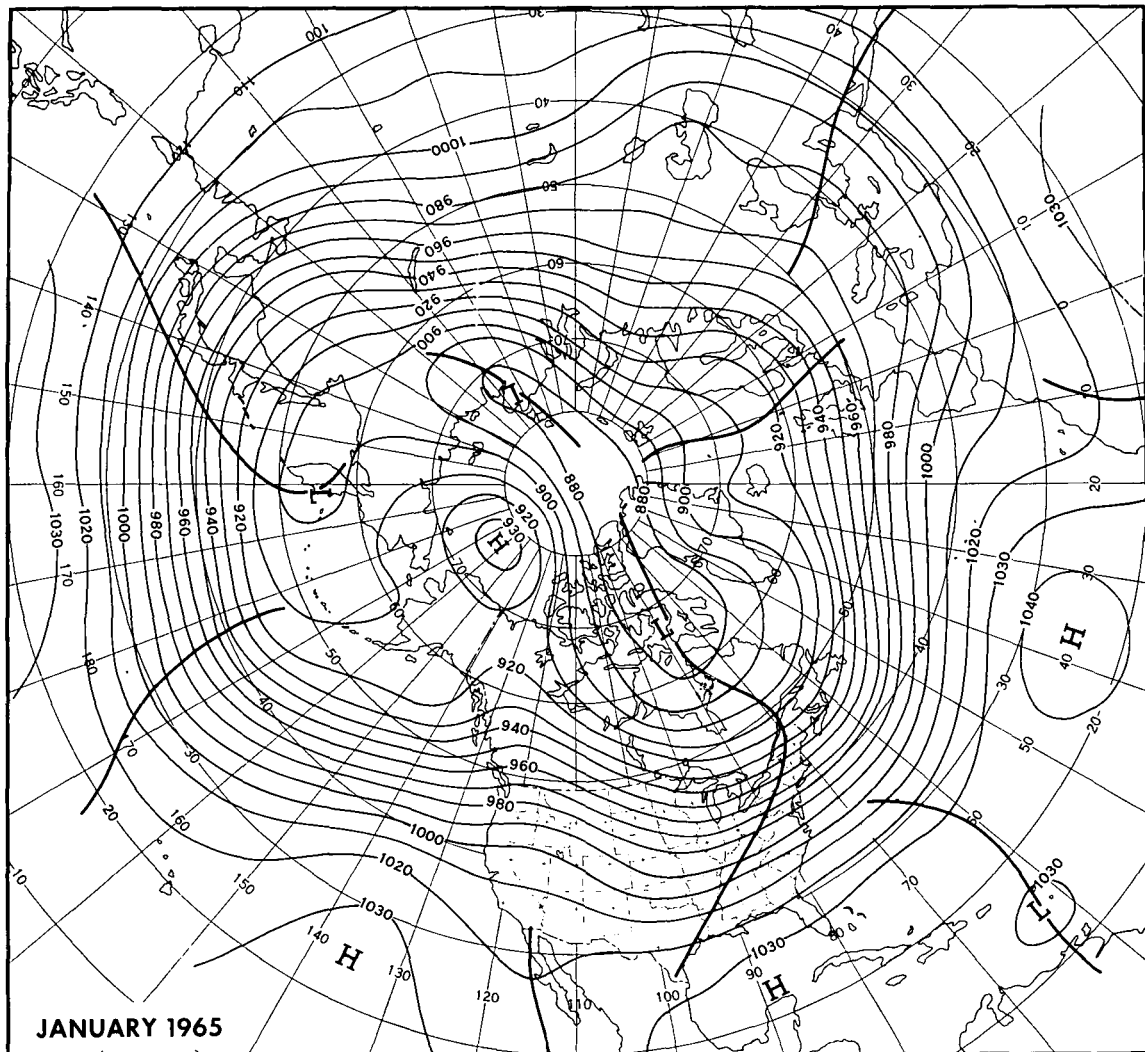


FIGURE 1.—Mean 700-mb. contours (tens of feet), January 1965. High-index circulation prevailed over western portion of Hemisphere.

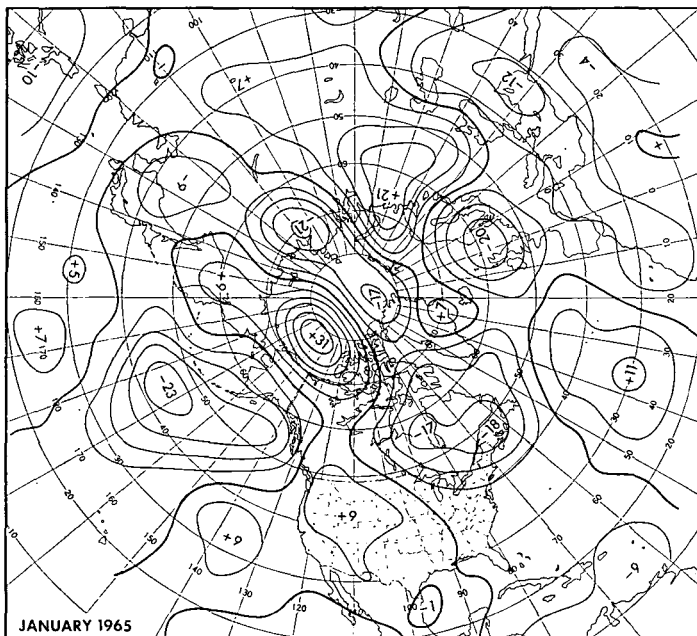


FIGURE 2.—Departure of mean 700-mb. heights from normal (tens of feet) for January 1965. Height departures in the United States and concurrent surface temperature anomaly were closely related.

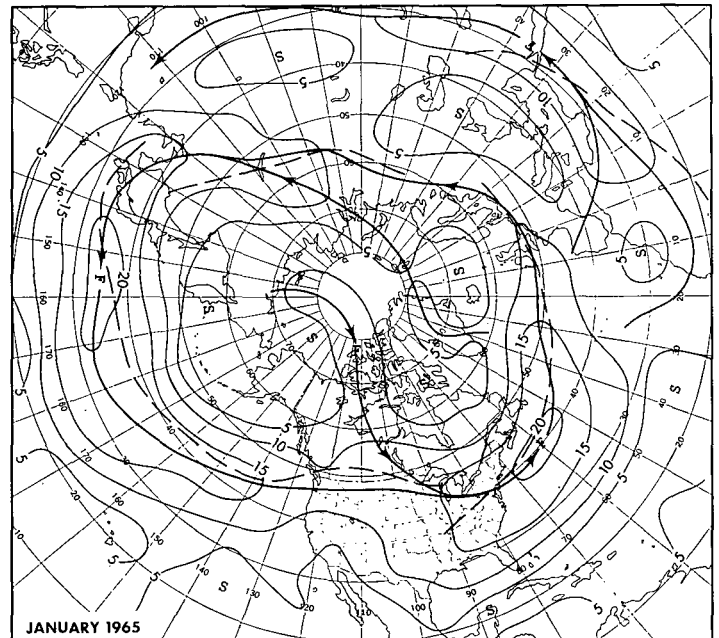


FIGURE 3.—Mean 700-mb. isotachs (meters per second) for January 1965. The primary axis of maximum west wind was close to its usual position over much of the Northern Hemisphere.

through the Northeast, although portions of New England were dry. The Concord, N.H., area had its driest January in 95 years.

A rather variable precipitation pattern was observed in the South, but amounts were generally close to normal. This is in accord with the weak anomalous flow and position of the mean trough (figs. 1 and 2).

4. WEEKLY EVOLUTION

The circulation early in the month consisted of a trough along the Pacific coast and one in the western Atlantic, with rather flat flow across North America (fig. 6A). This westerly flow pattern brought the warmest weather of January to the Nation during the week ending on the 10th (fig. 6B). Maximum temperature departures of 9° F. were observed in portions of the Rocky Mountain and Central States. The outstanding exception to the mild weather was in parts of Montana and the Dakotas where average temperatures were as much as 25° F. below normal. Extreme cold had prevailed in this area and in western Canada since mid-December.

Heavy precipitation fell in the Pacific Northwest during the first week (fig. 6C) in association with the deep coastal trough. A disturbance moving into the Great Basin spread moderate to heavy amounts of rain or snow across the Southwest. This system combined with a southeastward moving strong cold front to produce most of the heavy band of precipitation from eastern Texas to the Middle Atlantic States. Several days of unusual warmth, in which daily temperature departures from normal exceeded 20° F. from the Southern Plains to the Northeast, preceded the arrival of the cold front whose passage brought a new temperature regime to the East.

Marked amplification in the second week produced a simple wave pattern which featured a strong ridge over western North America flanked by deeper than normal troughs in the mid-Pacific and eastern North America (fig. 7A). Northwestern flow over mid-North America resulted in a sharp contrast in average temperature for the week with the strongest anomaly gradient across the Northern States (fig. 7B). Repeated outbreaks of Arctic air kept temperatures well below normal in the eastern half of the Nation while mild Pacific air associated with the upper-level ridge dominated the West. An example of extreme cold was the -42° F. recorded at International Falls, Minn., on the 14th, the lowest temperature observed there in 25 years. The coldest weather reached southern Florida near the end of the week when temperatures in the 30's were reported at Miami.

Precipitation was generally light west of the Mississippi in association with the large-amplitude northerly flow pattern which prevailed (fig. 7C). Amounts were mostly less than 0.25 in. across the Northern States, while little if any precipitation fell in the Southwest. Heavier precipitation fell in and east of the mean trough with amounts

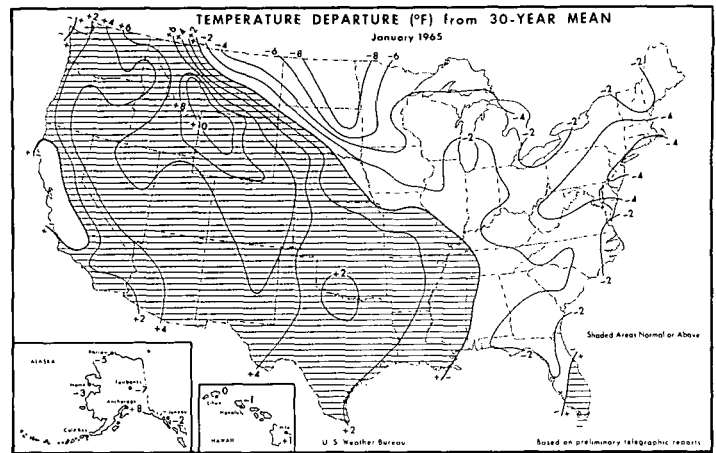


FIGURE 4.—Departure of average surface temperature from normal (°F.) for January 1965. (From [2].)

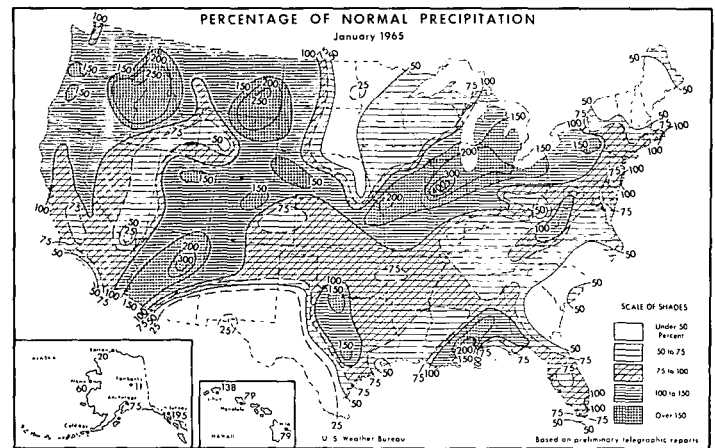


FIGURE 5.—Percentage of normal precipitation for January 1965. (From [2].)

averaging about half an inch. Much of this occurred late in the week as two storms, one moving southeastward across the Central Plains and the other off the south Atlantic coast, combined to spread a blanket of snow from Illinois to the east coast and southward to South Carolina and Georgia.

Shearing of the long-wave troughs accompanied an increase in westerly flow during the third week (fig. 8A). This occurred as the mid-Pacific trough weakened and the high-latitude portion moved into the Gulf of Alaska. The increase in the Pacific westerlies and shortening of the wavelength downstream was accompanied by progression and some de-amplification of the higher-latitude flow over North America. Retrogression of the trough in the Southeast was related to adjustment of the low-latitude wavelength, a compensation for the loss of the trough west of Baja California (fig. 7A).

Flattening of the flow over the United States during the third week (fig. 8A) brought warmer weather to the eastern half of the Nation (fig. 8B), although temperatures con-

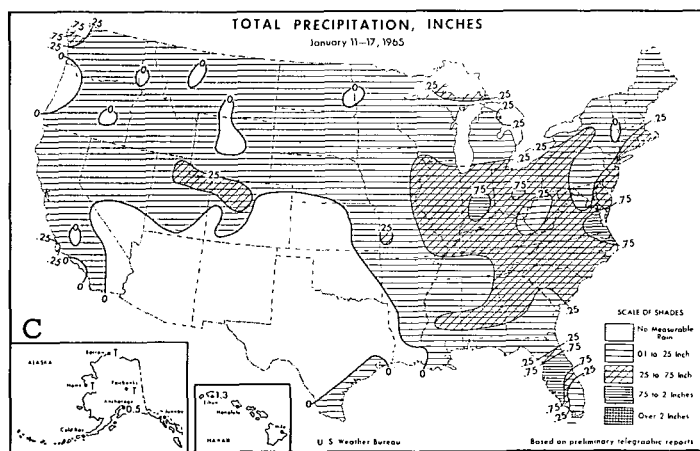
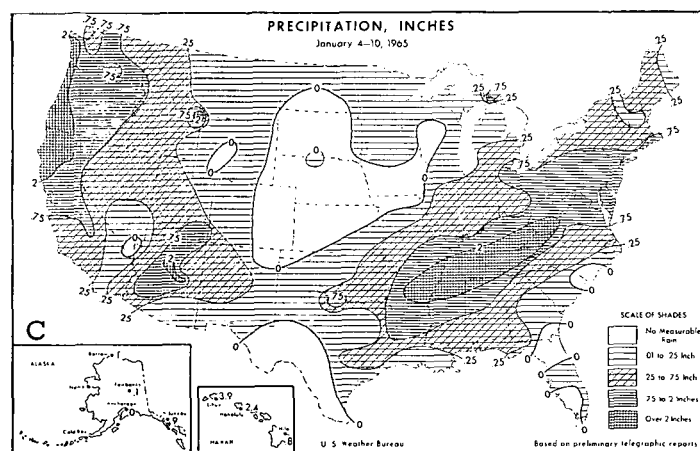
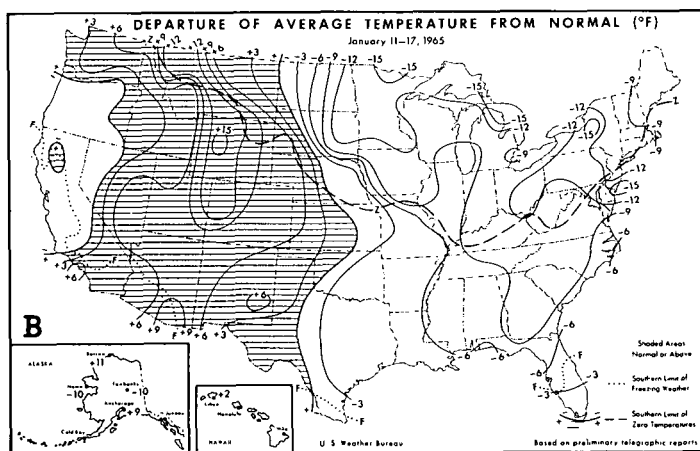
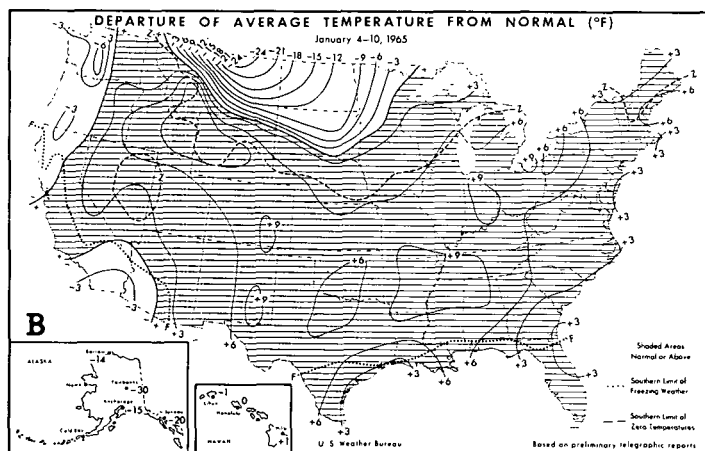
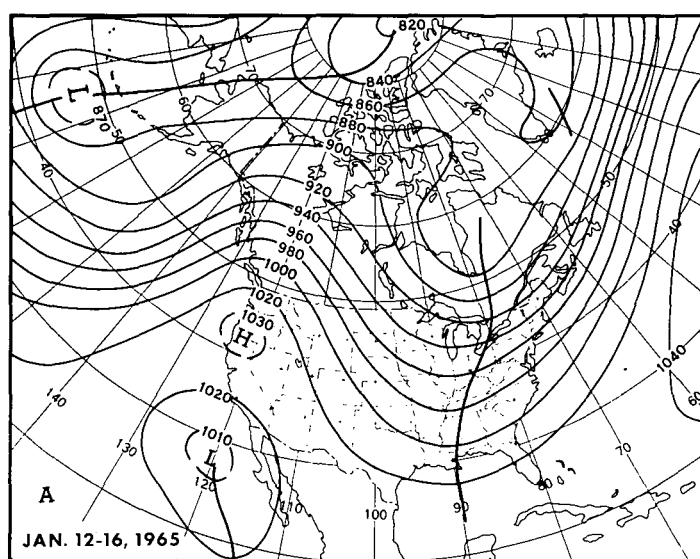
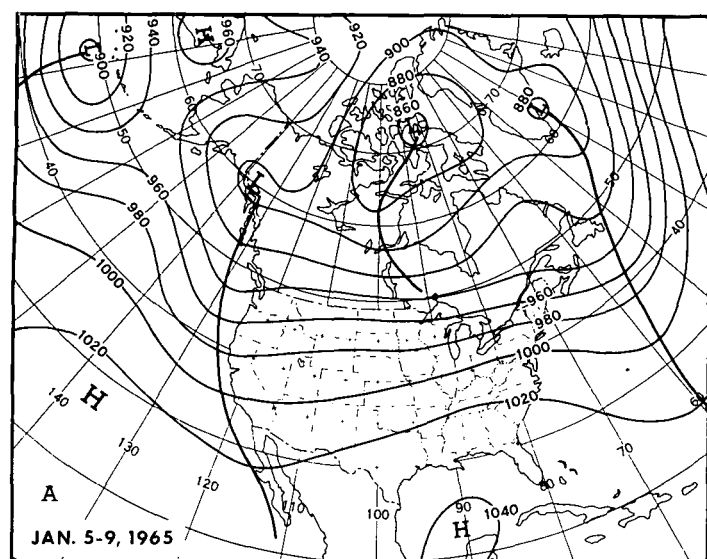


FIGURE 6.—(A) Mean 700-mb. contours (tens of feet) for January 5-9, 1965. (B) Surface temperature departure from normal (°F) and (C) total precipitation (in.) for January 4-10, 1965 (from [2]).

FIGURE 7.—(A) Mean 700-mb. contours (tens of feet) for January 12-16, 1965. (B) Surface temperature departure from normal (°F) and (C) total precipitation (in.) for January 11-17, 1965 (from [2]).

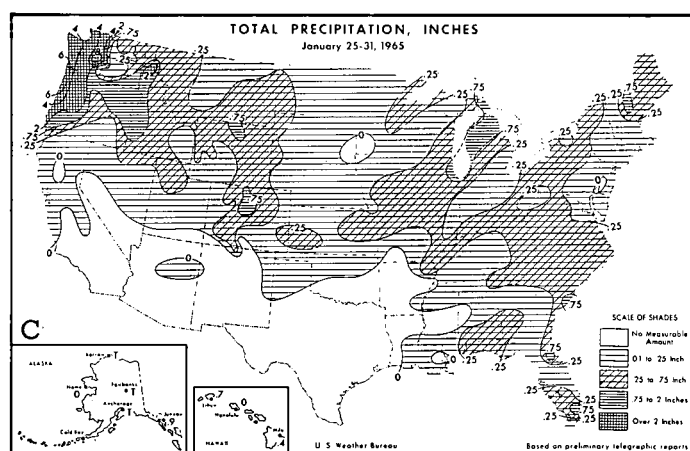
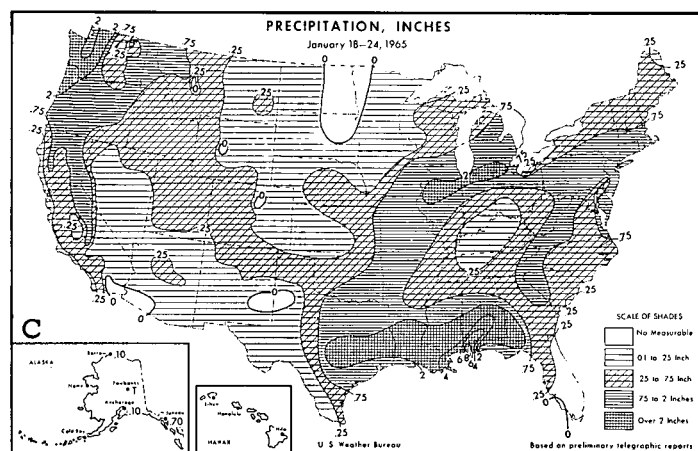
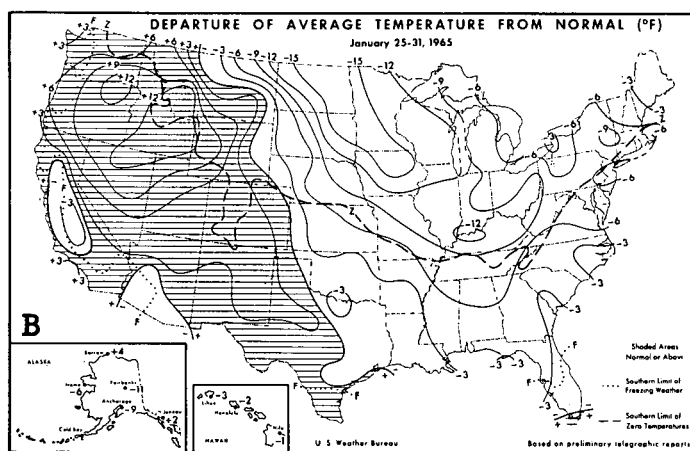
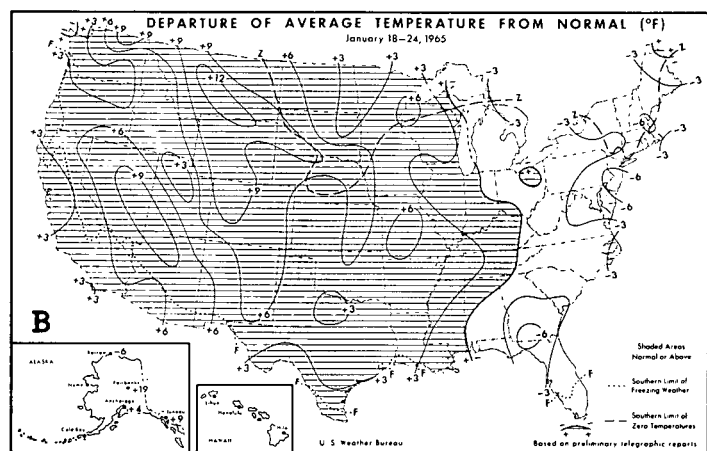
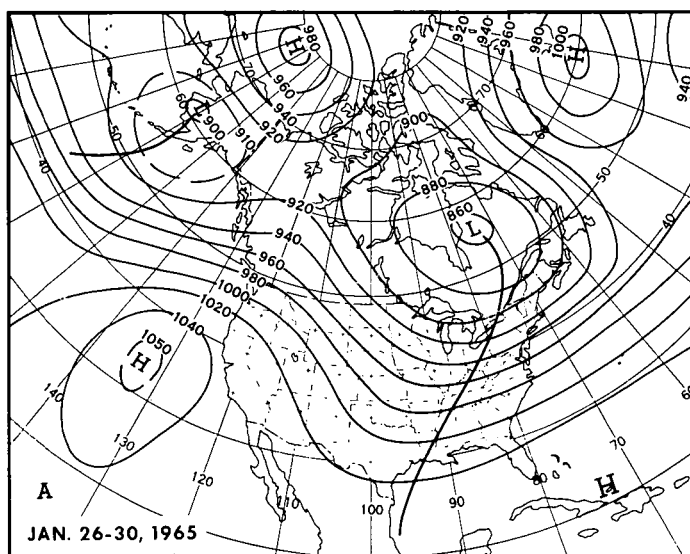
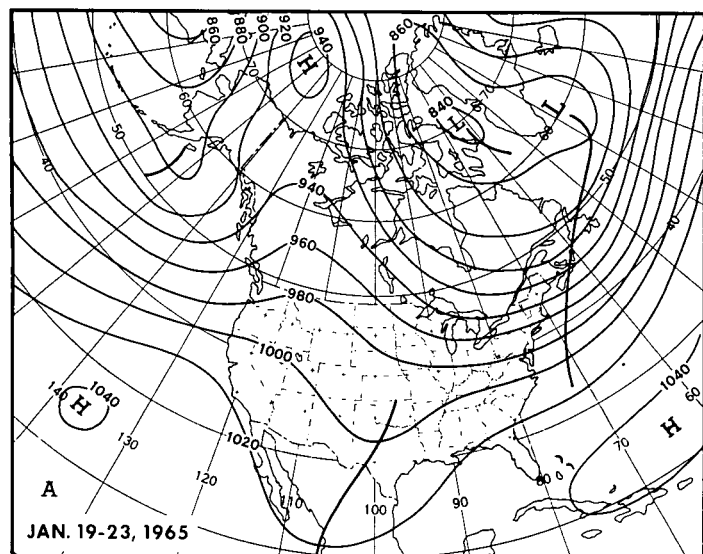


FIGURE 8.—(A) Mean 700-mb. contours (tens of feet) for January 19–23, 1965. (B) Surface temperature departure from normal (°F.) and (C) total precipitation (in.) for January 18–24, 1965 (from [2]).

FIGURE 9.—(A) Mean 700-mb. contours (tens of feet) for January 26–30, 1965. (B) Surface temperature departure from normal (°F.) and (C) total precipitation (in.) for January 25–31, 1965 (from [2]).

tinued to average below normal in the East. The western ridge, although weaker, helped sustain mild temperatures in the West.

Precipitation amounts increased in the West as a result of the storminess associated with cyclonic flow in the eastern Pacific and weakening of the western ridge (fig. 8C). Most of the precipitation in the Northwest fell late in the week in connection with a major Pacific storm. The trough in the Southern Plains States brought moderate to heavy rains to most of the Gulf States. To the north another weekend storm swept eastward from the Midwest, depositing 6 to 10 in. of snow from the Central Plains to New England. South of the snow belt sleet and freezing rain resulted in power failure in some communities.

The circulation over the United States during the fourth week of January was very similar to that of the second week (figs. 9A and 7A). The evolution from the third week was related primarily to the introduction of a large blocking High in the Atlantic. This blocking wave retrograded from northern Europe where upper-level heights were well above normal. In the Atlantic 700-mb. heights rose as much as 1,500 ft. from the third to the fourth week. Effects of the block also spread into North America where the Davis Strait Low was displaced about 900 mi.

to the south. At the same time deepening of the trough near Hawaii strengthened the Pacific coast ridge.

These circulation changes again introduced much colder weather into the Midwest and the temperature anomaly pattern the fourth week (fig. 9B) resembled that of the second week (fig. 7B). Heavy precipitation fell in the Northwest where amounts were heaviest in western portions of Washington and Oregon (fig. 9C). The combination of above normal temperatures, snowmelt runoff, and heavy rains brought severe flooding to parts of these States, although conditions were generally not as bad as the floods of the previous month [1]. In contrast, no precipitation of consequence fell in the Southern Plains or across the Southwest where the flow aloft was northerly. Two storms moving eastward from the Midwest spread precipitation, mostly snow, to the Atlantic coast during the week. By the end of January snow covered the northern half of the Nation, with the exception of the Far West.

REFERENCES

1. J. W. Posey, "The Weather and Circulation of December 1964—Record-Breaking Floods in the Northwest," *Monthly Weather Review*, vol. 93, No. 3, Mar. 1965, pp. 189–194.
2. U.S. Weather Bureau, *Weekly Weather and Crop Bulletin*, vol. 52, Nos. 2–6, January 11, 18, 25, February 1, 8, 1965.